

Momentum Pt 2

Recap

Collision of 2 Point masses

Conceptual questions

An object that has a small mass and an object that has a large mass have the same momentum. Which object has the largest kinetic energy?

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How can a small force impart the same momentum to an object as a large force?

Under what circumstances is momentum conserved?

Practice Problems

Train cars are coupled together by being bumped into one another. Suppose two loaded train cars are moving toward one another, the first having a mass of 150,000 kg and a velocity of 0.300 m/s, and the second having a mass of 110,000 kg and a velocity of -0.120 m/s. (The minus indicates direction of motion.) What is their final velocity?

A 70.0-kg ice hockey goalie, originally at rest, catches a 0.150-kg hockey puck slapped at him at a velocity of 35.0 m/s. Suppose the goalie and the ice puck have an elastic collision and the puck is reflected back in the direction from which it came. What would their final velocities be in this case?

A 0.240-kg billiard ball that is moving at 3.00 m/s strikes the bumper of a pool table and bounces straight back at 2.40 m/s (80% of its original speed). The collision lasts 0.0150 s.

(a) Calculate the average force exerted on the ball by the bumper.

(b) How much kinetic energy in joules is lost during the collision?

(c) What percent of the original energy is left?

A 0.0250-kg bullet is accelerated from rest to a speed of 550 m/s in a 3.00-kg rifle. The pain of the rifle's kick is much worse if you hold the gun loosely a few centimeters from your shoulder rather than holding it tightly against your shoulder.

(a) Calculate the recoil velocity of the rifle if it is held loosely away from the shoulder.

(b) How much kinetic energy does the rifle gain?

(c) What is the recoil velocity if the rifle is held tightly against the shoulder, making the effective mass 28.0 kg?

(d) How much kinetic energy is transferred to the rifle-shoulder combination? The pain is related to the amount of kinetic energy, which is significantly less in this latter situation.

What is the speed of a garbage truck that is 1.20×10^4 kg and is initially moving at 25.0 m/s just after it hits and adheres to a trash can that is 80.0 kg and is initially at rest?